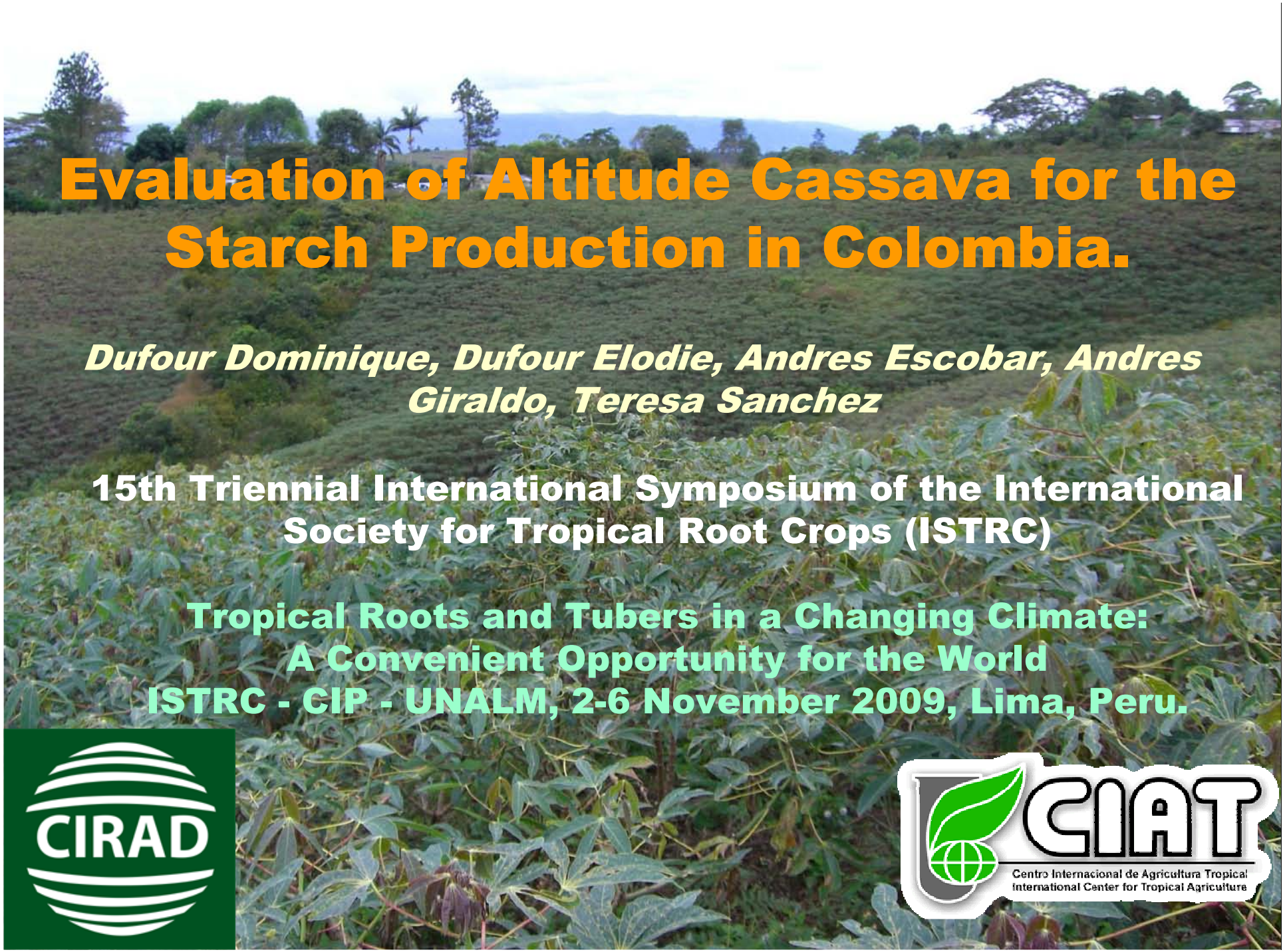


Evaluation of Altitude Cassava for the Starch Production in Colombia.

Dufour Dominique, Dufour Elodie, Andres Escobar, Andres Giraldo, Teresa Sanchez

15th Triennial International Symposium of the International Society for Tropical Root Crops (ISTRC)

Tropical Roots and Tubers in a Changing Climate: A Convenient Opportunity for the World
ISTRC - CIP - UNALM, 2-6 November 2009, Lima, Peru.

CIRAD

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

Highland Cassava Study: Diagnostic

Highland Cassava Study: Diagnostic

- 1500 - 2200 meters above sea level
- Cassava double purpose: good eating quality and industrial for starch processing
- Unique breadmaking capacity of highland fermented cassava starch
- Attractive market in Colombia

Highland Cassava Study : Diagnostic

- Low yield, high price of traditional cassava roots
- Harvesting 14 – 16 months
- Shortage of cassava roots for starch agro-industry in Colombian highland
- Low impact of pests and diseases in altitude
- Cassava improvement in CIAT
- Evaluation of new hybrids varieties

Highland Cassava Study : Methods

- 33 clones adapted to highland ecosystem
- 1750 m above sea level
- Cyanide content
- Eating quality
- Dry matter evaluation
- Root specific gravity (density)
- Starch content
- Starch functional properties

Highland Cassava Study : Results

	Root Yield (MT/Ha) (Media 3 harvest)	Root Yield (MT/Ha)	Starch Yield (MT/Ha)
SM 1834-20	30,0	32,11	8,03
SM 1495-5	25,3	30,03	7,64
CM 7595-1	26,6	30,00	7,85
SM 1058-13	27,3	27,30	
SM 1495-5	26,6	25,30	5,04
CM 7595-1	28,3	25,25	6,66
SM 1498-4	28,3	25,10	7,77
SM 1707-41	20,8	19,43	5,39
SM 1713-25	23,7	15,07	4,47
CG 402-11	25,9	13,22	3,40
MCol 1522	17,7	8,10	1,53
SM 1938-12	22,7	7,90	2,33

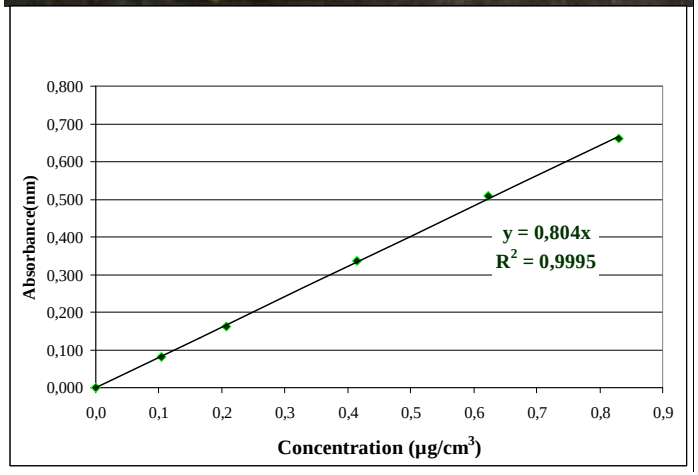
Highland Cassava Study : Results

Cyanide content

- Low cyanide content < 100 ppm
  (SM 1498-4 : 31 ppm)

- Exception :

  SM 1058-13 : 324 ppm (bitter taste)
  CG 402-11 : 183 ppm (bitter taste)



Highland Cassava Study : Results

Sensory evaluation

- Media = 3,9 (scale 1 to 5)
- Very good gustative quality for human consumption
  - CM 7595-1 always > 4,5
  - SM 1707-41 ; SM 1713-25 : always > 4
- Only two bitter varieties
  - SM 1058-13
  - CG 402-11

Highland Cassava Study : Results

- **32% < Dry matter < 42% ; (media: 38%)**
  (High for cassava around 33% in the World cassava germplasm held in CIAT)
  SM 1713-25 (44,0 %)
  SM 1498-4 (43,4 %)
  SM 1707-41 (41.7 %)
  CM 7595-1 (41,0 %)

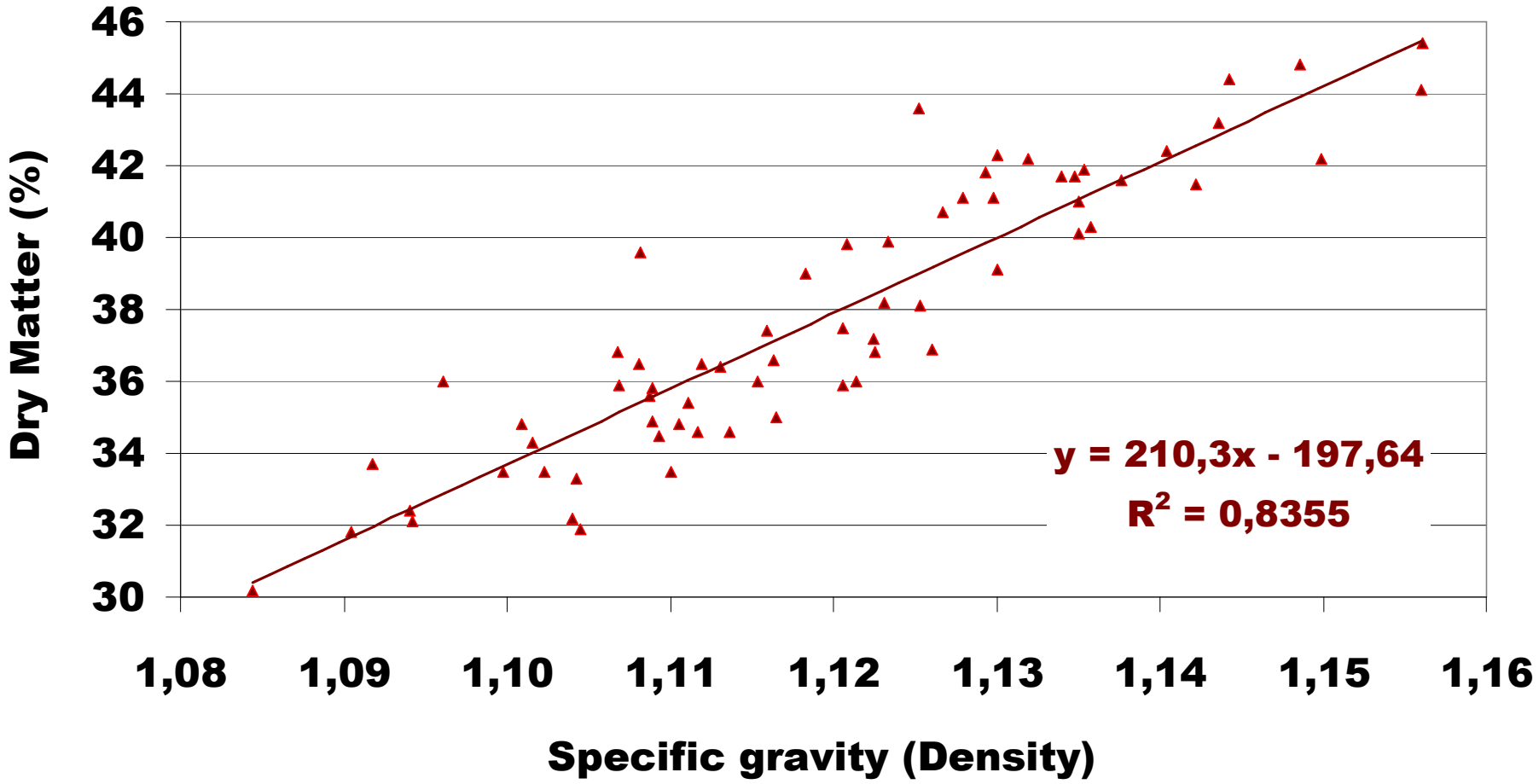
- **52% < Starch content < 95% ; (media 82%)**
  SM 1053-23 (91,5%)
  SM 1713-25 (91,1%)
  SM 1707-41 (89,1%)
  CM 7595-1 (89,1%)

- **61% < Starch extraction yield < 100% (media: 89,3%)**
  SM 1938-12 (99,9%)
  MCol 1522 (99,9%)
  SM 1834-20 (98,6%)
  SM 1495-5 (98%)

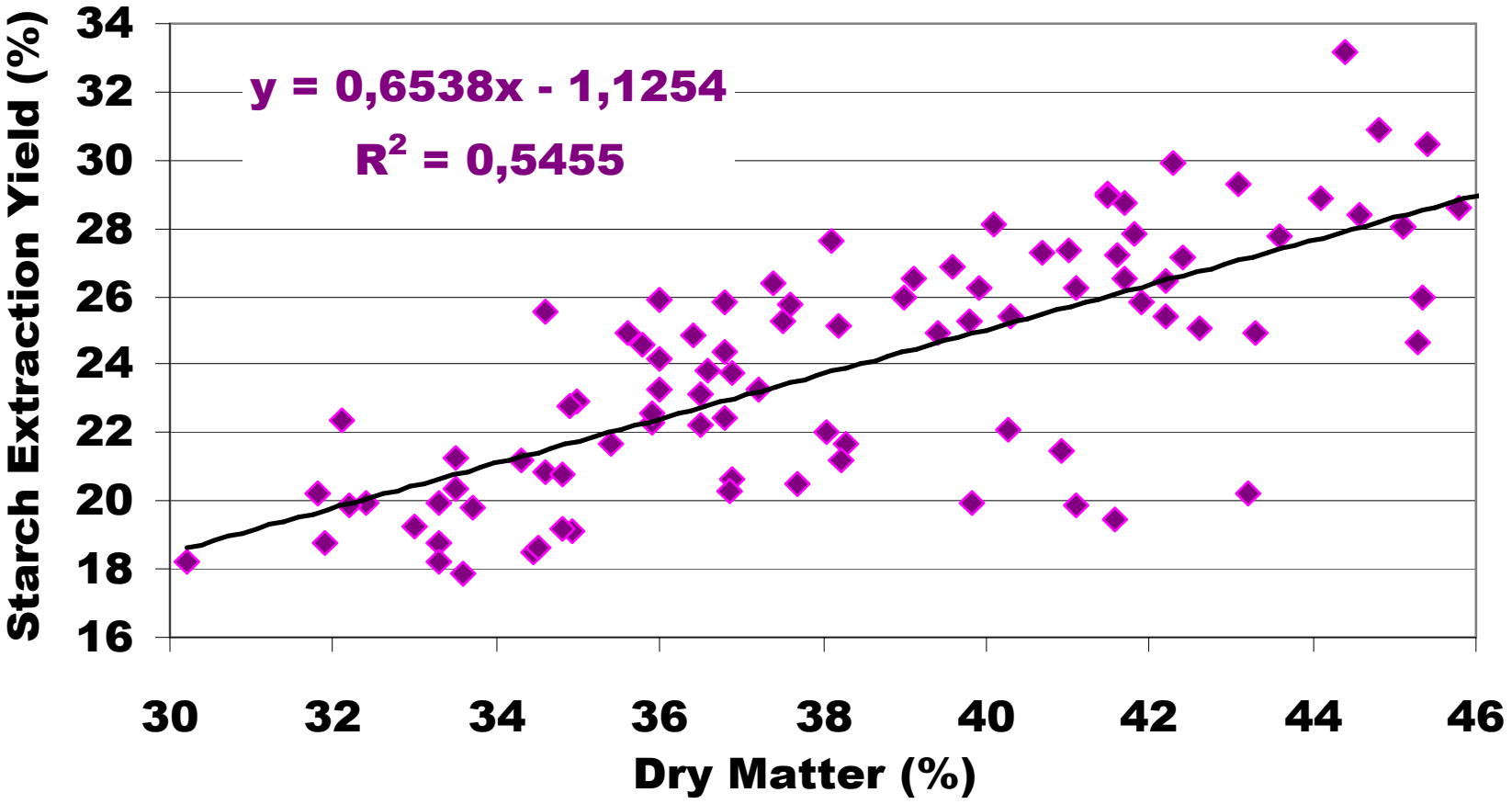
Highland Cassava Study : Results

Correlations		Starch (%)	Density	Extaction Yield	Cyanide content (ppm)	Taste
Dry matter (%)	Pearson correlation	0.418 (**)	0.882 (**)	0.674 (**)	-0.453 (**)	0.571 (**)
	n	*64*	*46*	*76*	*76*	*67*
Starch (%)	Pearson correlation	1	0.442 (**)	0.231 (*)	-0.317 (**)	0.364 (**)
	n		*46*	*76*	*76*	*67*
Density	Pearson correlation		1	0.639 (**)	-0.388 (**)	0.562 (**)
	n			*46*	*46*	*46*
Extaction Yield	Pearson correlation			1	-0.491 (**)	0.582 (**)
	n				*76*	*67*
Cyanide content (ppm)	Pearson correlation				1	-0.371 (**)
	n					*67*

Highland Cassava Study : Results

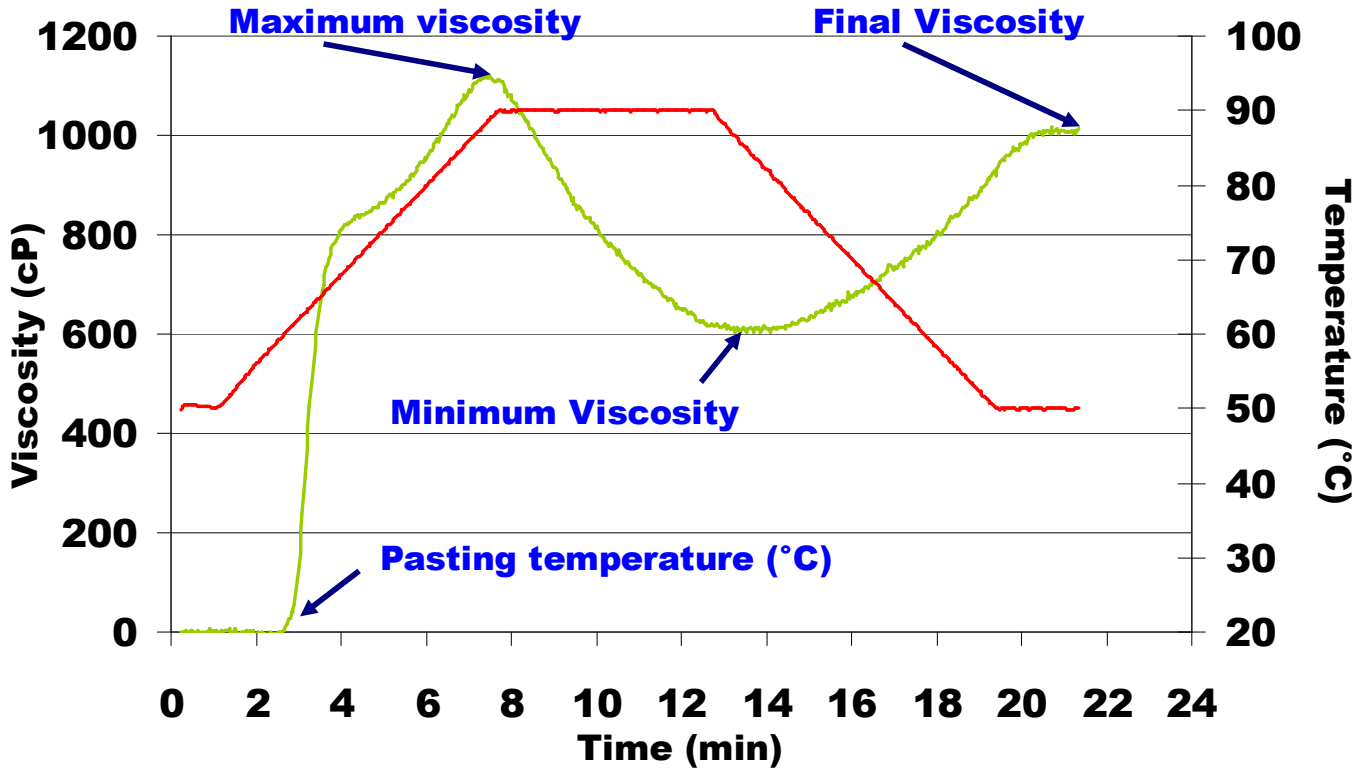


Highland Cassava Study : Results



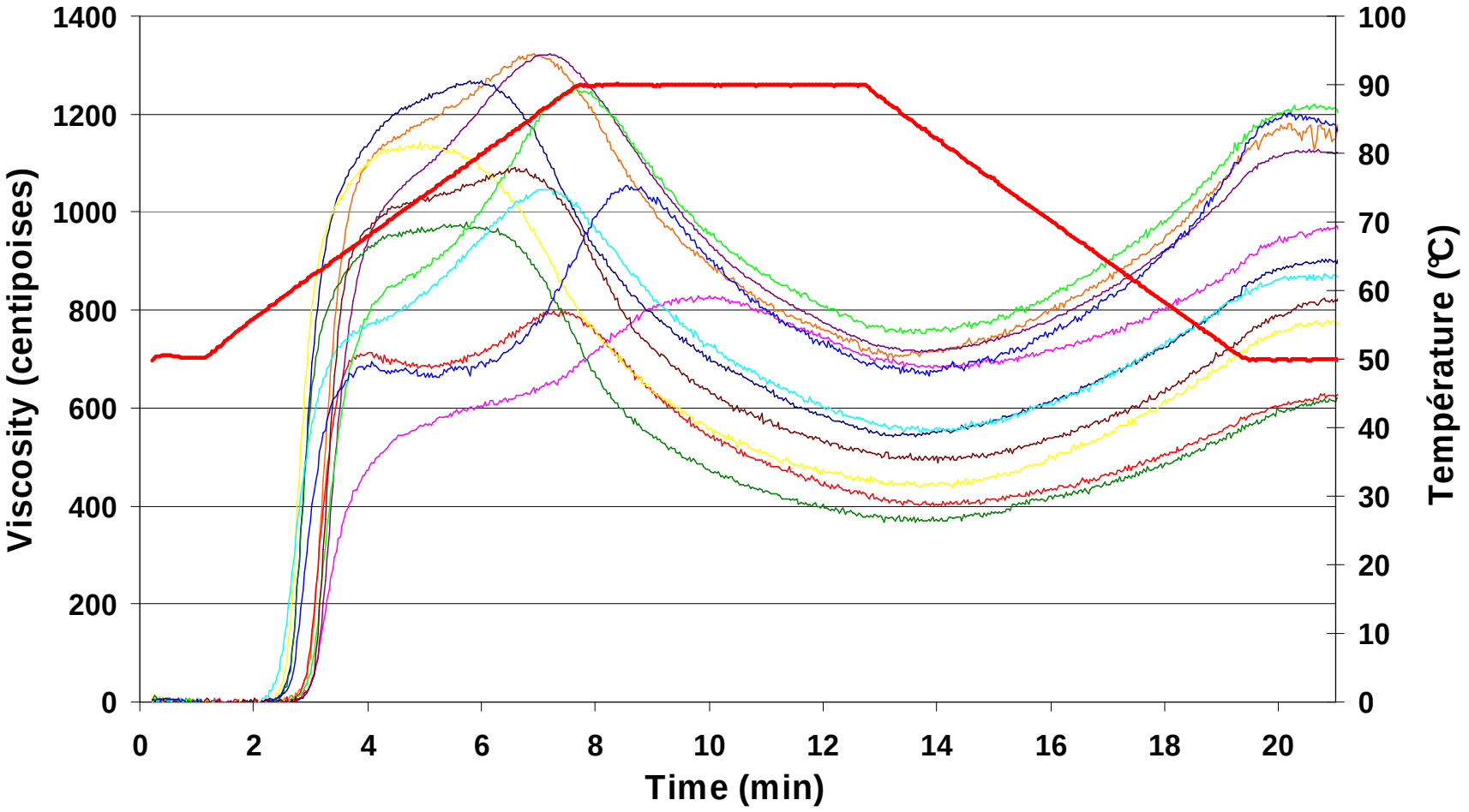
Highland Cassava Study : Results

Highland cassava starch Viscoamylogram (5%)



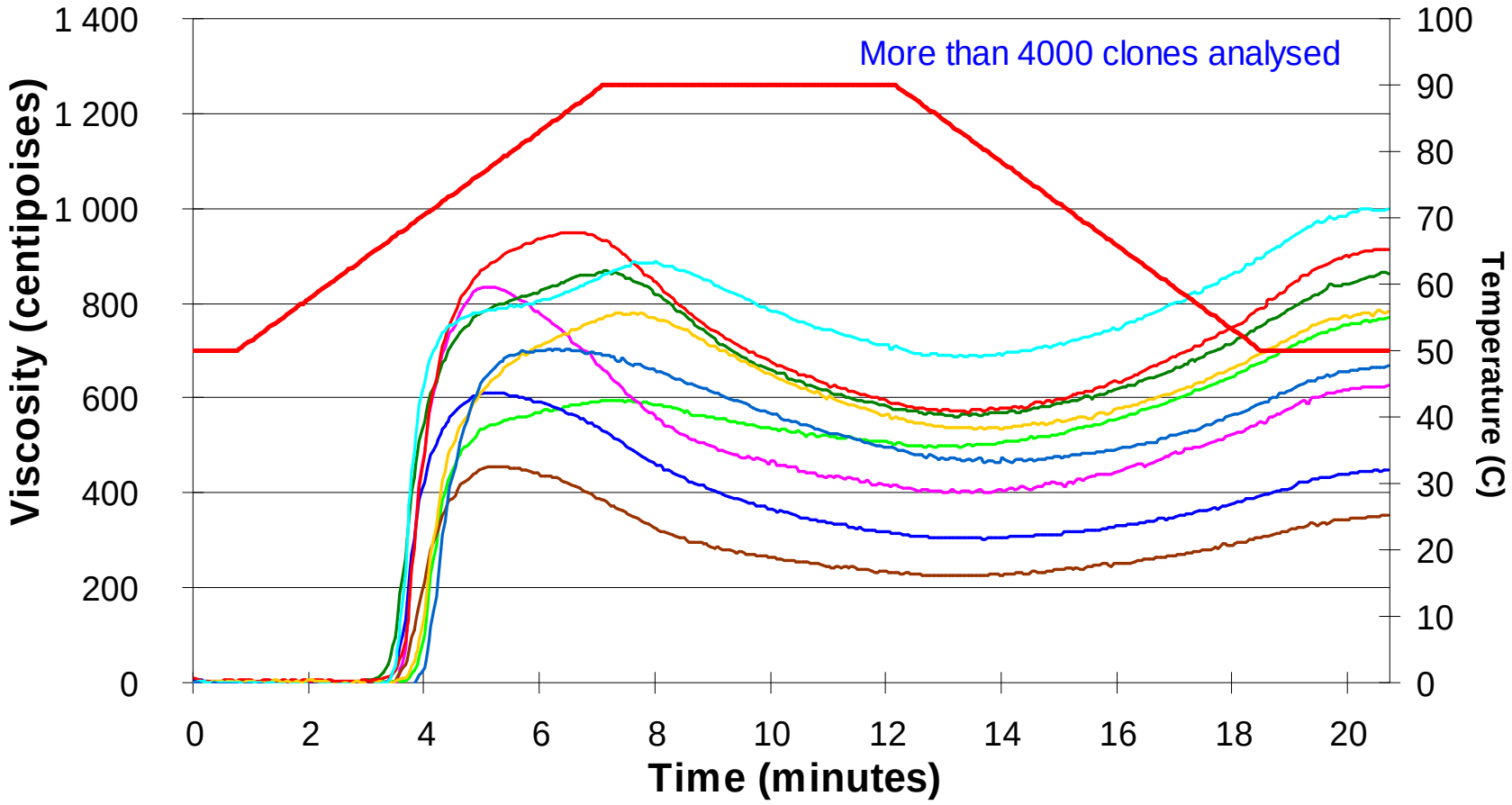
Highland Cassava Study : Results

Cassava starch viscoamylogram variability from Highland cassava (Popayan - 1750 m)



Highland Cassava Study : Results

Cassava starch viscoamylogram variability from World Cassava Germplasm (WCG - CIAT - 1000 m)



Highland Cassava Study : Results

- Highland cassava starch functionality (5% gels)
  - Lower Pasting temperature
    around 60°C versus 65°C for WCG
  - Two picks in RVA
  - Higher viscosity of gels
    around 1120cP versus 780cP for WCG
  - Peak time and ease of cooking higher
  - No difference in swelling power at 75°C but higher at 90°C

Highland Cassava Study : conclusions

CIAT highland cassava hybrid

- Improved root productivity (T/ha)
- High dry matter and starch
- Low cyanide, good for direct human consumption
- Double purpose: fresh consumption & industrial
- Starch productivity not only related to dry matter content and root productivity, but also with extractability of starch

Highland Cassava Study : conclusions

CIAT highland cassava hybrids

- Preference of varieties different from growers, starch industrial, consumers of fresh roots

Farmers	Industrial "rallandero"		Fresh cassava roots consumers
	Starch extraction yield	Dry matter	
SM 1834-20	SM 1834-20	SM 1713-25	CM 7595-1
SM 1495-5	CM 7595-1	SM 1498-4	SM 1707-41
CM 7595-1	SM 1498-4	SM 1707-41	SM 1713-25
SM 1058-13	SM 1495-5	CM 7595-1	SM 1498-4

- Differences of starch functional properties, may contribute to explain the unique breadmaking capacity of highland cassava starch

Thanks for your attention and for the colombians contributors of the study